Abstract N°: 3417

Interesting Associations Between Alopecia Areata and Iron Deficiency Anemia

Batya Davidovici[1], Yarden Drutin[2], Amir Amir Ben-Tov[2], Yonit Wohl[3]

[1]Rabin Medical Center, Dermatology, Petah Tikva

[2]Dana-Dwek Children's Hospital, Tel Aviv Sourasky Medical Center,, Pediatrics , Tel Aviv

[3]Kahn Sagol Maccabi, , Research and Innovation Center, Maccabi Healthcare Services, Tel Aviv, Israel

Introduction & Objectives:

Alopecia areata (AA) is a chronic autoimmune disorder causing non-scarring hair loss in well-defined patches. Its development is influenced by genetic predisposition, environmental factors, and immune dysregulation, with Th1 and Th17 immune responses playing significant roles. These immune responses disrupt the normal hair cycle, leading to hair follicle damage.

AA is commonly associated with other autoimmune conditions such as autoimmune thyroid diseases, vitiligo, lupus, rheumatoid arthritis, type 1 diabetes, and celiac disease, supporting the idea that AA is part of a broader systemic autoimmune process. These comorbidities can complicate disease management.

The association between iron deficiency anemia (IDA) and AA remains debated. While some smaller studies found no link, recent larger cohort studies and meta-analyses suggest a potential association. Biological explanations include chronic inflammation in AA leading to disrupted iron metabolism, coexistence of other autoimmune conditions that are linked to IDA, and immunosuppressive treatments such as corticosteroids potentially contributing to anemia.

Additionally, iron deficiency itself may impair immune function, particularly T-cell activity, which may worsen AA. Disrupted iron homeostasis may further contribute to immune dysregulation and sustain inflammation, potentially worsening hair follicle damage leading to a vicious cycle, a cycle that reinforces both conditions.

Given the conflicting evidence, this study aimed to clarify the relationship between AA and IDA using a large population-based cohort.

Materials & Methods:

A retrospective case-control study was conducted within a large HMO covering about 2.35 million individuals, including all AA patients diagnosed from 2005 to 2019. AA cases were matched 1:2 with healthy controls based on age and gender. Diagnoses of AA were confirmed by board certificated dermatologists using clinical codes; IDA was identified using ICD-9 codes (280.0, 280.1, 280.8, 280.9) via primary care physicians.

Statistical Analysis :

Analyses were performed using SPSS version 28.0 (IBM, Armonk, NY, USA). The Kruskal–Wallis test was used for continuous variables, while Pearson's $\chi 2$ test or Fisher's exact test were used for categorical variables.

The protocol was approved by an institutional review board.

Results:

The cohort included 33,401 AA patients and 66,802 controls. The average age of onset was 29.9 years, with a

gender distribution of 56.5% males and 43.5% females.(Table 1)

Overall, 11% (11,789 individuals) had IDA: 15% of AA patients (5,080) versus 10% of controls (6,709), showing a significant increase in IDA prevalence among AA patients (Odds Ratio = 1.61, 95% CI: 1.55–1.67, p < 0.01). This association was significant across all age groups. (Table 2)

In terms of diagnosis timing: IDA preceded AA in 40% of cases (2,032 patients),AA preceded IDA in 58% (2,946 patients), both were diagnosed within a 3-month window in 2% of cases (101 patients).

Conclusion:

While IDA has traditionally been viewed as a consequence of AA or its treatments, emerging evidence, suggests IDA may also contribute to the development or worsening of AA by impairing immune regulation.

This study reinforces a strong association between AA and IDA, though causality cannot be established due to the retrospective design.

It is important to recognizing such comorbidities as it may lead to improved management strategies for AA patients.

TABLES:

Table 1 Clinical and demographic characteristics of patients with alopecia areata and controls

		Total (*N* = 100,203)		Control (*N* = 66,802)		Case (*N* = 33,401)		*P*-value
		N	%	*n*	%	*n*	%	
Age (years) at diagnosis (mean +/- standard deviation)		29.9 +/- 16.9		29.9 +/- 16.9		29.9 +/- 16.9		1.000
Gender	Female	43,638	43.5	29,092	43.5	14,546	43.5	1.000
	Male	56,565	56.5	37,710	56.5	18,855	56.5	
Country of birth	Israel	82,873	82.7	53,829	80.6	29,044	87.0	< 0.001
	Other	17,330	17.3	12,973	19.4	4,357	13.0	
Socioeconomic status (scale 1–10 classes)	1–4 (low)	20,711	20.7	13,517	20.2	7,194	21.5	< 0.001
	5–7 (medium	55,184	55.1	36,448	54.6	18,736	56.1	
	8–10 (high)	24,308	24.3	16,837	25.2	7,471	22.4	

SES (socioeconomic status) was defined according to the Israeli Central Bureau of Statistics (scale 1-10), combining geographic and socioeconomic information for each neighborhood in Isael.

Table 2: Odds ratios for Iron deficiency anemia of Alopecia Areata patients and controls in different age groups

	Alopecia areata	**Iron deficiency anemia**				**OR (95%CI)**	**p-value**
		No		**Yes**			
		N	**%**	**N**	**%**		
All (N=100,203)	Control 66802	60093	89.96	6709	10.04	1.61 [1.55-1.67]	<0.001
	Case 33401	28321	84.79	5080	15.21		
Age <18 (N=27363)	Control 18242	16476	90.32	1766	9.68		
	Case 9121	7787	85.38	1334	14.62	1.60 (1.48-1.73)	<0.001
Age 18-40 (N=44169)	Control 29446	26931	91.46	2515	8.54		
	Case 14723	12756	86.64	1967	13.36	1.65 (1.55-1.76)	<0.001
Age > 40 (N=28671)	Control 19114	16686	87.3	2428	12.7		
	Case 9557	7778	81.39	1779	18.61	1.57(1.47-1.58)	<0.001